Title: Fun with Food and Fractions

Brief Overview:

In this unit, the students will use food and geometric shapes in a variety of activities to introduce and compare fractions. They will demonstrate their understanding of the fractions: 1/2, 1/3, and 1/4 by identifying, comparing, and representing these numbers using reasoning, oral communication, and problem solving strategies.

NCTM 2000 Principles for School Mathematics:

- **Equity:** *Excellence in mathematics education requires equity - high expectations and strong support for all students.*
- **Curriculum:** *A curriculum is more than a collection of activities: it must be coherent, focused on important mathematics, and well articulated across the grades.*
- **Teaching:** *Effective mathematics teaching requires understanding what students know and need to learn and then challenging and supporting them to learn it well.*
- **Learning:** *Students must learn mathematics with understanding, actively building new knowledge from experience and prior knowledge.*
- **Assessment:** *Assessment should support the learning of important mathematics and furnish useful information to both teachers and students.*
- **Technology:** *Technology is essential in teaching and learning mathematics; it influences the mathematics that is taught and enhances students' learning.*

Links to NCTM 2000 Standards:

- **Content Standards**

<u>Number and Operations</u>
The students will develop an understanding of fractions as part of a whole unit and be able to identify fractional parts in the real-world, models, and representational forms through the use of food and geometric shapes. Fraction equivalence and comparisons will be introduced.

<u>Geometry</u>
The students will recognize fractional parts of geometric plane and space figures to visually analyze and solve real-life situations.

- **Process Standards**

  Problem Solving
  The students will move from various concrete problem solving exercises using objects and models to apply the concept of "fair shares" to abstract applications while identifying and comparing fractional relationships.

  Reasoning and Proof
  The students will orally explain, as well as demonstrate how they determined their answers. Each day's activities include different tasks, which allow the students' flexibility in determining the overall outcome or answer.

  Communication
  Daily oral language activities will be performed to develop the students' vocabulary so that they will effectively communicate their understanding of basic fraction concepts to others. Monitoring of students' receptive understanding of the unit outcomes will be based on expressive language skills.

  Connections
  The students will use the basic fractions 1/2, 1/3 and 1/4 to find equal parts of geometric shapes and everyday objects. Equivalent fractions will be introduced by paper folding and shading to show that smaller parts will take up the same space as a larger part of a whole. Making a recipe, playing games, and folding paper into thirds like business letters will be used to connect what the students learn to real-life experiences.

  Representation
  The concept of symbolic notation and word names will be introduced to represent the fractions 1/2, 1/3 and 1/4. Through the use of geometric shapes and food students will understand fractional parts as they relate to a whole and that equivalence represents two parts that take up the same space in another shape or object.

Grade/Level:

K-1

Duration/Length:

Three – four days

Prerequisite Knowledge:

Students should have working knowledge of the following skills:

- Same or different
- Numerals 1-10
- Shapes: circle, rectangle, square
- Whole and part

Student Outcomes:

Students will:

- work cooperatively in groups.
- show an understanding of fair shares or equal parts.
- identify fractions 1/2, 1/3, and 1/4.
- order and compare fractions 1/2, 1/3, 1/4 using manipulatives.
- write the fractions 1/2, 1/3, and 1/4.

Materials/Resources/Printed Materials:

Day One:

- Poster board with fraction 1/2 written in large bold numbers
- Numbers 1 and 2 with velcro on back
- Two large circles, one rectangle and one square made from construction paper for each student
- Scissors, crayons, glue
- In a baggie, one candy bar, graham cracker, and marshmallow per pair of students
- Envelopes with individual number cards 1-6 for each student
- Student Resource Sheets 1 and 2
- Teacher Resource Sheet 3

Day Two:

- Student Resource Sheets 3 and 4
- Poster board and construction paper
- Apple, banana, and candy bar
- Plastic knife and stick pin
- Overhead projector, geoboard, Fraction Islands Kit, and transparencies
- Die numbered 1 to 6
- Geoboards
- Fraction Island packets
- Yarn

Day Three:

- Student Resource Sheets 5 and 6
- Crayons, colored pencils, or markers
- 8 1/2 x 11 paper (2 per student)
- Precut circles (2 per student)
- Food: 3 apples, 3 bananas, graham crackers (one set per pair of students), marshmallow pies (one per pair of students)

Day Four:

- Student Resource Sheets 7, 8, 9, and 10
- Fraction Builders
- 8 1/2 x 11 paper (3 sheets for each student)
- Crayons, colored pencils, or markers
- Glue sticks
- Scissors

Development/Procedures:

Day 1 - Halves

Introduction:
Display a poster with "1/2" written in large, bold letters. On the other side of the poster, draw a 4" horizontal line. Introduce the unit by saying, "Today, we are going to start learning about fractions. We are going to participate in and complete some activities using fractions for the next three days." Ask, "What is a fraction?" Wait for students to share their thoughts. Pointing to the poster, tell the students that 1/2 is an example of a fraction. Turn the poster over showing a line in the middle of the poster.

Activity 1:
1. Show the students a circle. Have students identify the shape. Explain to the students that this circle can be divided into 2 equal parts.
2. Distribute a large black circle, scissors, and one crayon to each student. Ask the students to divide the circle into 2 equal parts. Instruct them to use scissors, crayons, or make a fold to make 2 equal parts.
3. When finished, choose several students to share how they divided the circle into 2 equal parts.
4. Ask, "How can we prove that we have 2 equal parts?" Hand out another circle. Have the students fold, cut and put one half of the circle on top of the other. Ask the following questions:
    - Are they the same size?
    - Are they equal?
    - How many parts do you now have?
    - Can someone show me 1/2 of the circle?
    - How many parts show 1/2 of the circle? (Put the number one on the top of the line on the poster.)
    - How many parts do you have that make a whole circle? (Put the number two under the line on the poster.)
5. Explain that this one part is 1/2 of the circle. Showing the 1/2, state that this is a fraction.
6. Using a large square and rectangle made out of construction paper, invite students to come to the front of the class, identify the shape, and show how they can make 2 equal parts of these shapes. Then, ask them to hold up 1/2 of the rectangle and square. Ask the other students if that is 1/2, while pointing to the 1/2 on the poster.

Explain to the students that they will be making a fraction book for the next three days and that the worksheets they complete will be going into their fraction books. These fraction books will demonstrate their understanding of the fractions 1/2, 1/3, and 1/4.

Activity 2:
Distribute Student Resource Sheet 1. Tell students to take out their crayons. Explain the directions to the students. Allow time for the students to complete the worksheet. Collect the papers and assess student understanding.

Activity 3:
1. Explain to the students that they are now going to do a fun activity using food to demonstrate their understanding of 1/2. Divide the students into pairs. Give each pair of students a baggie that contains 1 rectangular candy bar, 1 marshmallow, 1 graham cracker (rectangular), and a plastic knife.
2. State that they will be making s'mores. (You may want to ask if any students have ever had or made s'mores.) Tell the students to divide the food items so that each of them gets a fair share. Each student should get the same size or 1/2 of each food item. Caution students to safely use the plastic knife! Ask the students to identify the food item that will need to be cut with the plastic knife.
3. The teacher should move around the room making sure that students understand the directions. When students are finished dividing their food items, tell them they now are to make sandwiches with them. Students should place the candy on top of graham cracker. Next, the marshmallow is placed on top of the candy. When finished, ask for volunteers to show their final product. Ask other students to assess the final product, noting if each student received a fair share or equal pieces of the food items. Allow time for the students to eat and enjoy.

Activity 4: (Make sure the 1/2 fraction poster is taken down.)
1. Ask students which fraction they have been investigating.
2. Distribute Student Resource Sheet 2, glue, and an envelope with individual number cards 1-6. Remind students that the worksheets go into their fraction book. Read the directions to the students. Take out the number cards. Allow time for students to complete activity.

Homework Assignment:
Complete Student Resource Sheet 3. Read the activity with the children. Emphasize that parents can help. Students will review completed homework in class on the following day.

Day 2 - Thirds

Review and discuss the homework from the previous day.
Present posters showing two circles, two squares, and two rectangles to review the Day 1 concepts. Ask students to identify the geometric shapes.

Select separate students to cover (with pre-cut 1/2 circle, 1/2 square and 1/2 rectangle) one-half of one of the circles, squares and rectangles, respectively. After each of the shapes has been covered, compare the relationship between the whole and one-half of each shape. Conclude the review by showing a whole apple and an apple cut in halves. Ask a student volunteer to explain the relationship between the apple cut in halves to the whole apple. (One whole = two halves)

Activity 1:

Introduce the fraction one-third as follows:

1. For each student make up a packet which contains the following material:
   - Three-inch by six-inch rectangle
   - Three one-inch by six-inch strips of paper
2. Ask students to name the shape that the three-inch by six-inch paper represents.
3. Using the overhead show a transparency with a three-inch by six-inch rectangle.
4. Instruct the students to take the three strips of paper and cover the rectangle. Note that this represents a whole.
5. Ask how many strips of paper were used to cover the rectangle. Remove two of the strips and ask how many strips remain. Elicit from the students that this represents one third. Show the fraction 1/3 (Large poster board with fraction 1/3).
6. Ask students to count the total number of parts it takes to cover the entire rectangle. (three) Then, ask if only part one of the rectangle is covered, what fraction would this represent? (one-third)
7. Have the students write in the air one (1), then line (____), and then, three (3). While they are doing this put the 1, the _____ and the 3 on the previously prepared velcro poster board.
8. Write the word "one-third" on the chalkboard and show the students. Have the students choral read the word as you point to it.

Activity 2 - Play the 'Kat Kat Game':

1. Divide the students into groups of three.
2. Each group will need a deck of teacher made cards which has blank cards, cards which show the fraction 1/3 and cards with the word one-third. The group will also need approximately fifteen 1-inch by 3-inch strips and 3-inch by 6-inch game boards that have been previously divided into thirds.
3. Each student rolls a number die. The student with the lowest number goes first. That student takes a card off the deck. If the card shows 1/3 or the words one-third, the student says 'one-third' and takes a one-inch by three-inch strip. He covers a section of his game board with this strip and the next student takes a turn. If a blank card is picked, play passes to the next student.
4. The first student to cover his 'Kat Kat' game board wins the game. Make sure to emphasize that a completed game board represents one whole that is made up of three parts. (One whole = 1/3 + 1/3 + 1/3)

Activity 3:
Hand out the 'Kat Kat' bars that are divided into thirds to groups of three students. First, ask how many parts represent the whole. Then, ask if each student will get an equal part or fair share. Break off one part and ask what fractional part of the whole this represents. (Answer: One-third) Point to the 1/3 poster when the response of one-third is given. Do the same with the remaining two sections.
Discuss one whole candy bar= 1/3+ 1/3 +1/3. Each student may eat 1/3 of the candy bar.

Activity 4:
Hand out Student Resource Sheet 3. Instruct the students to color one-third of each of the rectangles and write 1/3 under each of them. This worksheet will be included as part of their fraction book.

Activity 5 – The Magic Banana:
Take a banana. Divide it into thirds by penetrating with a stickpin and moving the pin up and down to cut inside the peel. Tell the students that you are going to perform magic. Break the blade off of a plastic knife. Show the students the banana and the knife. Select a student to 'magically' cut the banana into thirds, using only the handle and an invisible blade. The student pretends to cut through the banana two times. At this time, you peel the banana and show the three equal parts that were once the whole banana. WOW! Reinforce that one whole is equal to three parts and one part of the whole is one-third. You also may wish to emphasize that 2 cuts will make 3 pieces.

Activity 6:
Distribute Student Resource Sheet 4. Instruct the students to color one-third of the banana and write 1/3 under it. This worksheet will go into their fraction book.

Activity 7 – Fraction Islands (optional)
1. Divide students into groups of three. Give each group an 11 X 11 geoboard which has been divided with rubber bands or yarn as follows:
   - 3 squares by 4 squares
   - 3 squares by 4 squares
   - 3 squares by 5 squares
2. Ask students what geometric shapes are represented on the geoboards. (rectangles) Give each group a packet that contains three straight Fraction Islands strips of light blue (3 squares), pink (4 squares), green (6 squares), black (7 squares) and dark blue (8 squares).
3. Allow time for the students to explore items from #1 and #2. At the end of play time (5 – 10 minutes) discuss how the islands are alike and different.
4. Tell students to pretend that the areas inside each of the three rubber bands on their geoboards represent KAT KAT candy bars. The students need to share each candy bar fairly by finding enough same colored strips to fit exactly in each rectangle. Allow time for the students to complete this activity.
5. Using the overhead geoboard discuss each KAT KAT candy bar:
   a. Ask students to identify the colors of the completed candy bars. (3 squares by 4 squares = pink, 3 squares by 5 squares = green and 3 squares by 6 squares = brown)

b. Ask how many islands are in each candy bar. (three) Point to the '3' on the fraction poster.
c. Demonstrate and then have the students remove two of the three strips from the 'pink' candy bar. Ask how many islands are now in the rectangle. (one) Point to the numerator on the fraction poster. Ask again how many islands fill the rectangle. (three) Point to the fraction poster and have the class choral read 'one-third'.
d. Have the students replace the two pink fraction islands they previously removed. Elicit from students that 3 parts or 1/3 + 1/3 + 1/3 are equal to one whole candy bar.
e. Repeat #5.c. and #5.d. for the green and brown candy bars.

Day 3 - Fourths

Introduction:
Review whole and halves using an apple and a banana. Ask the students, "How many parts are in a whole apple? How many parts are in a whole banana? (one) Cut the apple and banana in two halves. Ask how many parts make up the whole fruit now? (two)

Cut each half into two equal parts to make fourths. Ask the students, "How many parts make up each whole fruit now? (four) One part of the fruit would be written "one-fourth or 1/4. On poster paper write 1/4 and one-fourth.

Activity l - Food
Give each pair of students one graham cracker, one marshmallow pie, and one plastic knife. Have students decide how to divide each item into fourths so that each person has equal shares. Ask, " How many pieces of the graham cracker does each student have? (2/4) How many pieces of marshmallow pie does each student have? (2/4)." Allow students time to eat their food fractions: graham crackers, marshmallow pies, and fruit slices. Ask students if they know another name for 2/4. (1/2)

Activity 2 - Rectangles
Distribute two rectangles (8 1/2 x 11 pieces of paper) and crayons to each student. Ask students, "How can we easily change this rectangular paper from one whole to one- half?" (fold in half) Fold paper in half, open, and label each half of paper with the symbolic notation 1/2. Review how one whole = 1/2 +1/2 = 2/2. Ask students to color 1/2 of the rectangle.

Have students take the second rectangular paper and fold in half, then fold in half again. Open and discuss how many parts are now in the whole (4). Label each section of one side of the paper with the symbolic notation 1/4.
Discuss: one whole = 1/4 + 1/4 + 1/4 + 1/4= 4/4.
Ask students to place the one-half colored rectangle, from the first paper, on top of the labeled fourths paper. Ask, "How many fourths equal one half?" (2). Have students color the two fourths, which are adjacent to the half colored.
Have students explain to their partner how they know that 1/2 = 2/4. (They take up equal space; they are the same size, etc.)

Activity 3 - Circles

Distribute precut circles to each student. Have the students fold one circle neatly in half, then open and label each side of the crease with symbolic notation for one-half (1/2). Color 1/2 of this circle.

Have students fold the second circle in half, then fold it in half again to make fourths. Ask students to open the circle and count how many parts they made (4). Label each part of this circle with the symbolic notation for fourths (1/4). Discuss how one whole = 1/4 + 1/4 + 1/4 + 1/4 = 4/4.

Ask students, "How many fourths equal one half?"(2) Have students place the colored one-half circle over the circle divided into fourths. Explain to your partner how you know that 1/2 is equivalent to 2/4 (both take up equivalent space). Have students complete Student Resource Sheets 5 and 6 to show their knowledge of fourths. Collect Student Resource Sheets 5 and 6 to add to the their fraction book.

Day 4 – Comparing/Ordering Fractions: 1/2, 1/3, 1/4

Activity 1:

Give each student three pieces of paper (8 1/2 x 11). Give students these oral directions:

1. Fold first paper into halves. Label each section 1/2.
2. Fold second paper into thirds. Label each section 1/3.
3. Fold third paper into fourths. Label each section 1/4.

Discuss: Which fraction is the largest? (1/2) Which fraction is the smallest? (1/4)
How many fourths = one half? (2)

Activity 2:

1. Give each student Fraction Builders to build: 1 whole = 1/2 + 1/2, 1 whole = 1/3 + 1/3 +1/3, and 1 whole = 1/4 + 1/4 +1/4 +1/4
2. Use Fraction Builders or paper models of halves, thirds and fourths to complete Student Resource Sheet 7. Collect Student Resource Sheet 7 to add to their fraction book.

Activity 3 – Culminating Activity

1. Give each student Student Resource Sheets 8, 9, and 10.
2. Instruct students to cut out shapes (squares and rectangles) from Student Resource Sheet 10.
3. Instruct students to use the correct fraction (1/2, 1/3, 1/4) or words (less than or greater than) to complete each number sentence on Student Resource Sheets 8 and 9.

Performance Assessment:

On-going assessment is by teacher observation and completion of student resource sheets, a fraction book, and a final performance assessment (Activity 3, Day 4). Rubrics are included for the fraction book and the final performance assessment. (Teacher Resource Sheets 2 and 3)

Extension/Follow Up:

- Create a fraction display table.
- Try teacher-made fraction games such as Go Fish for Fractions.
- Continue Fractions Book with fifths, sixths, etc.
- Read books: Fractions are Parts of Things by J. Richard Dennis, Mouse Days by Leo Lionni and The Three Hat Day by Laura Gerlinger.

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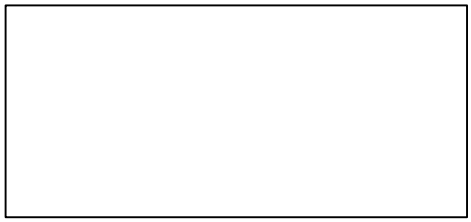
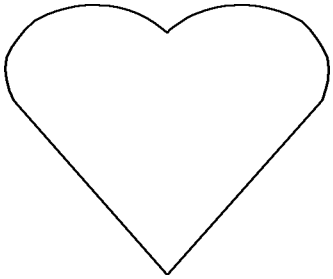
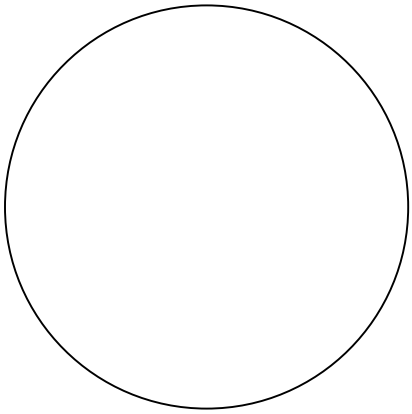
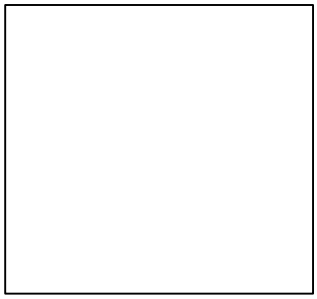
Name:
Date:

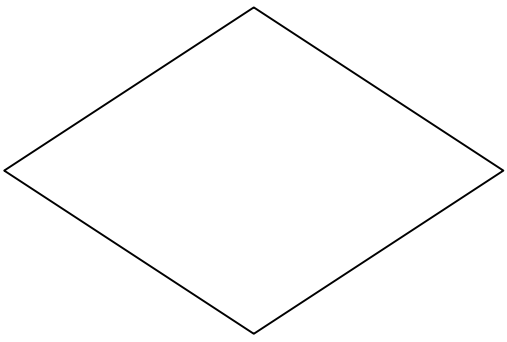
Color ½ of each shape:

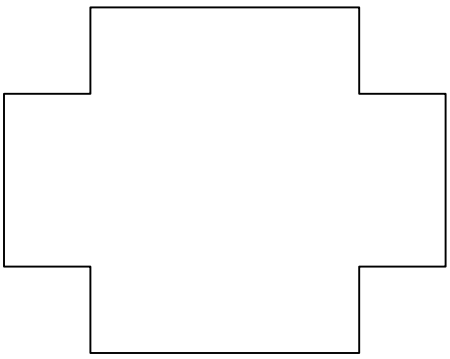












Name:
Date:

Paste the correct numbers above and below the line that symbolize one-half.

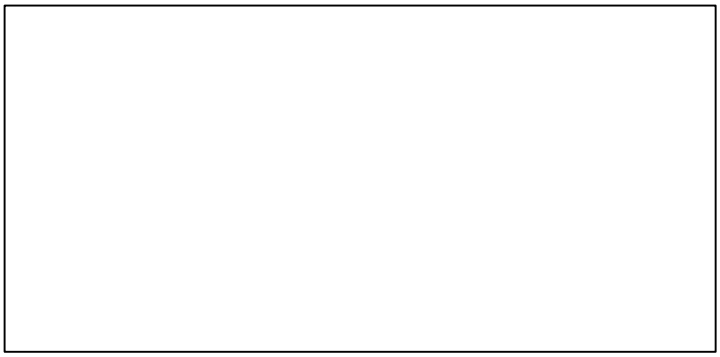
_____

Name_____

KAT KAT FRACTIONS

Color one-third of the shapes:

Write one-third in the ☐:

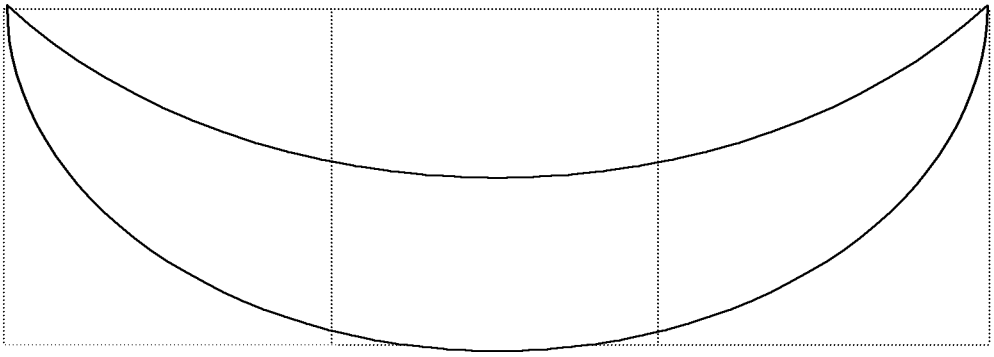


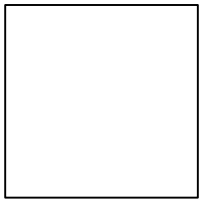
Name_____

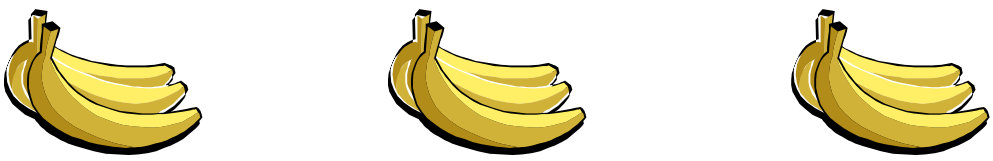
MAGIC BANANA FRACTION

Color one-third of the magic banana.

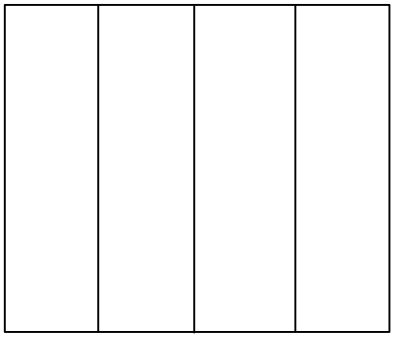
Write one-third in the ☐ :



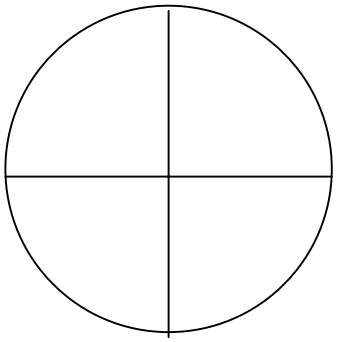




Color 1/4

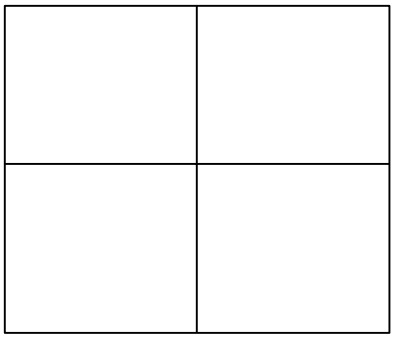


Color 2/4



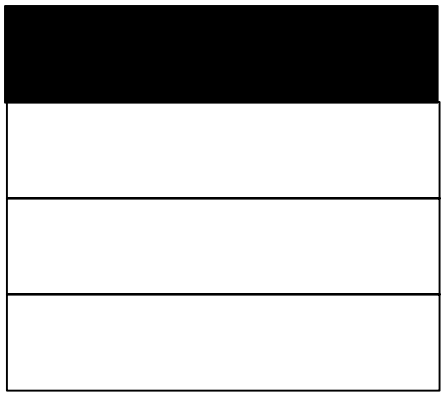
Color 4/4

Color 3/4



Under each figure below, write a fraction for the shaded part.

Fraction Bank: 1/4, 2/4, 3/4, 4/4

1. 

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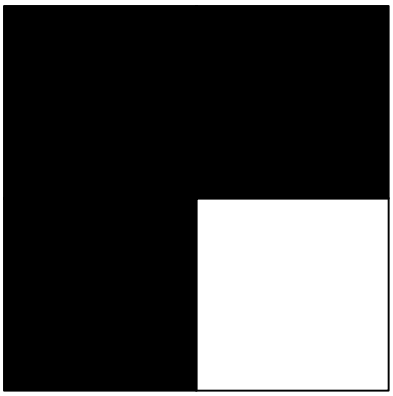
2. 

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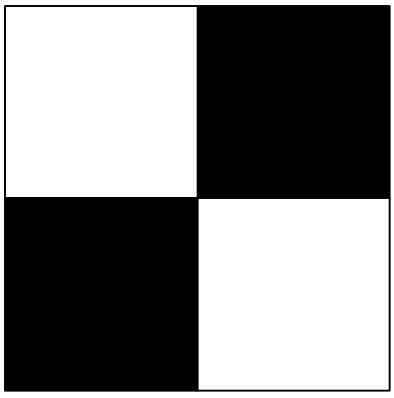
3. 

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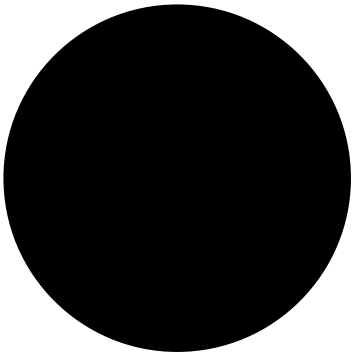
4. 

_____

Use your Fraction Builders.

Circle the correct answer below.

l. Which fraction is the largest?

$\frac{1}{2}$ $\frac{1}{4}$ $\frac{1}{3}$

2. Which fraction is the smallest?

$\frac{1}{2}$ $\frac{1}{4}$ $\frac{1}{3}$

3. Which is larger?

$\frac{2}{3}$ $\frac{3}{4}$

4. One-half is less than one third.
greater than

5. One-fourth is less than one-third.
greater than

FUN WITH FRACTIONS

Parts of a Whole

1/2 + ☐ = One Whole

1/3 + ☐ + ☐ = One Whole

1/4 + 1/4 + ☐ + ☐ = One Whole

FUN WITH FRACTIONS

Equivalence

1/2 = 1/4 + ☐

Compare

1/2 is ☐ than 1/3

1/4 is ☐ than 1/2

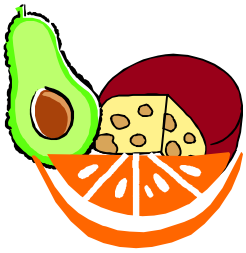
1/3 is ☐ than 1/4

FUN WITH FRACTIONS

Cut out the shapes below and use to complete the number sentences on Student Resources 8 and 9.

1/2	**1/2**	**1/2**	**1/2**
1/3	**1/3**	**1/3**	**1/3**
1/4	**1/4**	**1/4**	**1/4**

less than
less than
greater than
greater than



Teacher Resource Sheet 1

December 4, 2000

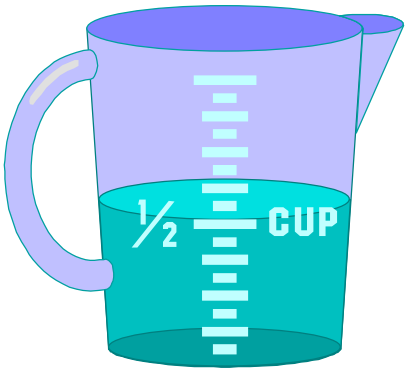
Dear Parents,

We are starting a unit on fractions. Today, we completed several activities identifying the fraction, 1/2.

Your child has been given an assignment that may need your help. Students should find examples of things that show the fraction, 1/2. One example could be a half glass of milk or one shoe instead of two.

Have your child draw pictures or write down all the 1/2 fraction items he/she finds and write the fraction 1/2 next to the picture of that item.

Sincerely,
Your Teacher



Rubric for Fraction Book

Points	
3	**All directions are followed.** **All ten student resource sheets are completed.** **Homework assignment is completed.** **Work is neat.**
2	**Some directions are followed.** **Seven student resource sheets are completed.** **Homework assignment is completed.**
1	**No directions are followed.** **Student resource sheets are incomplete.** **Homework assignment is incomplete.**
0	**No assignments completed.**

Rubric for Performance Assessment
(Activity 3, Day 4)

Points	Criteria
3	The student: Completed 5 to 7 number sentences correctly. Correctly pasted 3-4 fractions (1/2, 1/3, or 1/4) in the number sentences. Correctly compared 2-3 sets of fractions. Completed the assessment neatly and legibly.
2	Completed 3 to 4 of the 7 number sentences. Correctly pasted 2-3 fractions (1/2, 1/3, or 1/4) in the number sentences. Correctly compared 1-2 sets of fractions. Completed the assessment neatly and legibly.
1	Completed up to 2 number sentences. Correctly pasted 1-2 fractions (1/2, 1/3, or 1/4) in the number sentences. Correctly compared 1 set of fractions.
0	Blank, off-topic, or no response.